

Using Enhanced NWI Data for Improved Characterization and Landscape-Level Functional Assessment of Wetlands

When standard NWI data are combined with LLWW descriptors to produce a NWI+ database, wetland functions can be predicted for large geographic areas in addition to producing a more detailed characterization of wetlands across the landscape. A summary of the NWI+ database and applications as of July 2010 were provided in the *National Wetlands Newsletter* article “NWIPlus – Geospatial Database for Watershed-level Functional Assessment” (Tiner 2010).

To use the NWI+ database for predicting wetland functions, relationships between wetland properties in the database and wetland functions had to be developed. The Northeast Regional Wetland Coordinator worked with several groups of scientists and wetland practitioners from the East Coast, Midwest, and Southwest on various NWI+ applications to develop these relationships for what now are eleven functions of interest: surface water detention (for nontidal wetlands only), coastal storm surge detention, streamflow maintenance, nutrient transformation, retention of sediment and other particulates, carbon sequestration, bank and shoreline stabilization, provision of fish and aquatic invertebrate habitat, provision of waterfowl and waterbird habitat, provision of habitat for other wildlife, and provision of unique, uncommon, or highly diverse plant communities (see Tiner 2011b for the latest correlation report).

Since building NWI+ databases is not a standard NWI product, it has been applied to pilot study areas and to areas of interest in some regions. Applications are particularly widespread in the Northeast where the technique evolved. In the Northeast, we’ve attempted to add NWI+ data to updates of NWI data for large geographic areas and have produced statewide NWI+ databases for Delaware, Connecticut, Massachusetts, Rhode Island, and New Jersey. Similar data should be available for several areas in other regions by the end of 2013. Completed NWI+ datasets may be viewed online through the NWI+ Web Mapper. Several states have produced similar data for select watersheds or regions, including Georgia, Michigan and Montana (see the State Data links for their results), while other states are conducting pilot studies or statewide applications (e.g., Minnesota, New Mexico, Oregon, and Wisconsin).

NWI+ Web Mapper

The NWI+ Web Mapper is an online mapping tool that allows users to view special project data prepared by the NWI that are not available through the FWS’s “Wetlands Mapper.” In addition to viewing NWI and LLWW types for these areas, a number of other data layers may be available. These layers may show wetlands that have been predicted to be important for providing numerous functions, potential wetland restoration sites, and lands that may support wetlands based on soil mapping (hydric soils lacking a recognizable wetland photo-signature).

Once you have opened the mapper, you’ll see a map of the United States plus icons on the tool bar above the map and a list of five topics: “Intro to the Mapper” (a must-read description of mapper contents and operation), “Wetlands One-Stop” (takes you to the page where other sources of wetland information can be accessed), “NWI” (takes you to the NWI website), “Northeast NWI” (takes you to the home page of the Northeast Region’s NWI Program), and “CMI” (takes you to the home page of Virginia Tech’s Conservation Management Institute). The icons allow you to: 1) view the data on a variety of maps or imagery (“Choose Basemap”), 2) show available data layers (“Map Contents”; click to view



available NWI+ data), and 3) add data layers (either from ESRI sources via “Browse” or from the web via “Search”)

NWI+ Data Layers

Several data layers may be available for each project area: NWI Types, LLWW Types (NWI+ Landscape, NWI+ Landform, and NWI+ WaterFlowPath), eleven Functions, Restoration Types (NWI+ Restoration Type1, NWI+ Restoration Type2), NWI+ P-WetAreas, and layers for accessing more information (e.g., Wetland Codes). These layers are described below. The date of the inventory is listed in the project name, e.g., Connecticut Wetlands 2010.

NWI Types – this layer displays wetlands and deepwater habitats mapped by the U.S. Fish and Wildlife Service National Wetlands Inventory Program and classified by the Service’s official wetland classification system (Cowardin et al. 1979).

LLWW Types – these layers (“NWI+ Landscape”, “NWI+ Landform”, and “NWI+ WaterFlowPath”) display NWI wetlands and deepwater habitats by hydrogeomorphic-types according to Tiner (2003a, 2011a): landscape position (Figure 1), landform, and water flow path. For this classification, ponds have been separated from other wetlands for more detailed classification.

Function – these layers display wetlands identified as potentially significant for each of eleven functions: surface water detention (SWD), streamflow maintenance (SM), coastal storm surge detention (CSS), nutrient transformation (NT), sediment and other particulate retention (SR), carbon sequestration (CAR), bank and shoreline stabilization (BSS), provision of fish and aquatic invertebrate habitat (FAIH), provision of waterfowl and waterbird habitat (WBIRD; Figure 2), provision of other wildlife habitat (OWH), and provision of habitat for unique, uncommon, or highly diverse plant communities (UWPC). Descriptions of these functions and the wetlands that provide those functions are found in correlation reports and tables that update the relationships (Tiner 2011b, 2003b).

NWI+ Restoration Type1 – this layer identifies former wetlands (now nonwetlands) that are in a land use where wetland restoration may be possible. Type 1 restoration sites should be former wetlands that were converted to either potentially “developable land” by drainage and/or filling or deepwater habitats by impoundment (diking) or excavation (dredging). Most of the former sites should be agricultural land that involved wetland drainage or barren land that may represent drained wetlands or filled wetlands. The latter sites are deepwater habitats created from wetlands by impoundment (e.g., L1UBHh in NWI code) or by dredging (e.g., E1UBLx in NWI code). All of the designated sites were mostly likely wetlands based on soil mapping; these sites should not include deepwater habitats created by flooding dryland in river valleys. The referenced sites should have potential for restoration. Whether or not they are viable sites depends on site-specific characteristics, landowner interest, agency funding/priorities, and other factors. For the name of the soil type mapped at a particular site, click the “NWI+ Rest Type 1 Soil Codes” (Figure 3). If the site is agricultural land or barren land, restoration will typically require action to bring back the hydrology and may involve removal of fill. For an inundated sites (now deepwater habitats), full or partial removal of the dike or dam would be needed to restore more natural hydrologic regimes, while excavated sites would require restoration of wetland elevations by bringing in suitable fill material.

NWI+ Restoration Type2 – this layer shows existing wetlands that have been impaired to a degree that affects their ability to function like an undisturbed natural wetland (Figure 4).

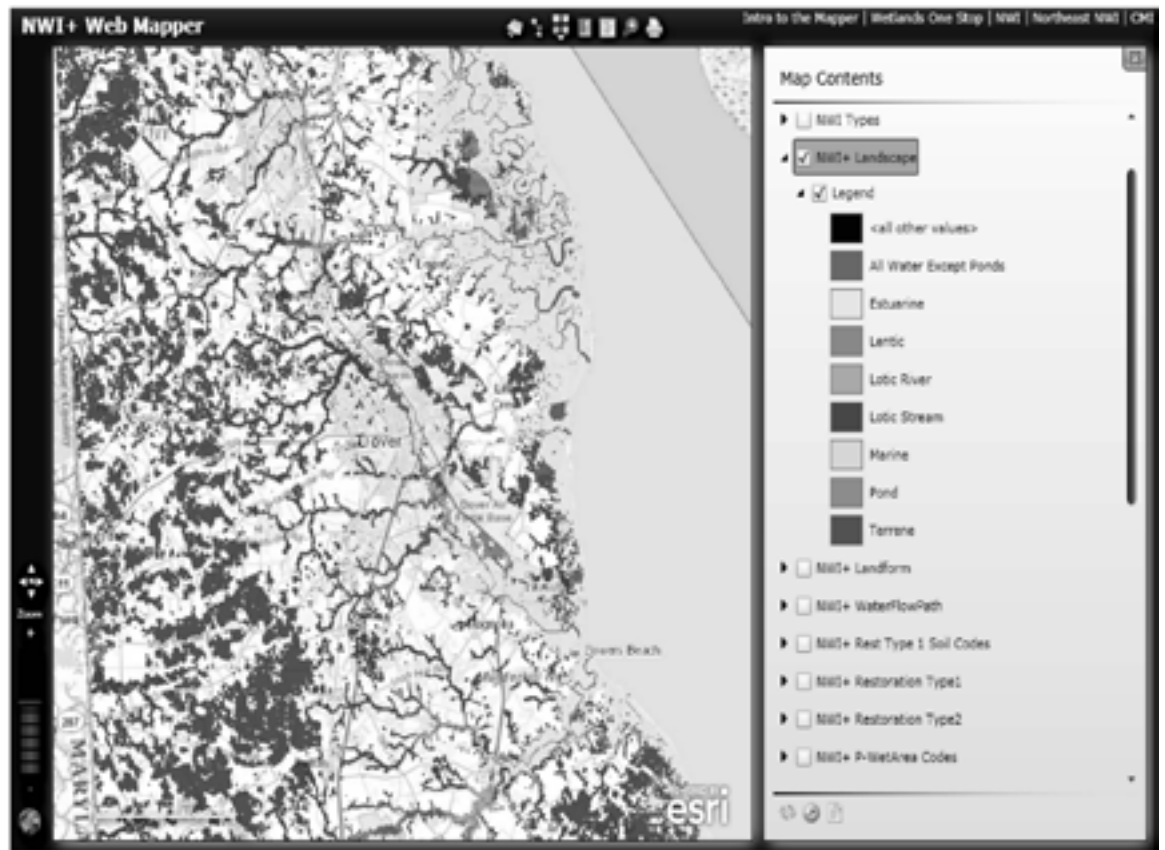


Figure 1: Wetlands around Dover, Delaware classified by landscape position as displayed on the NWI+ Web Mapper. (Note: Color-coded types are shown in black and white for this article.)

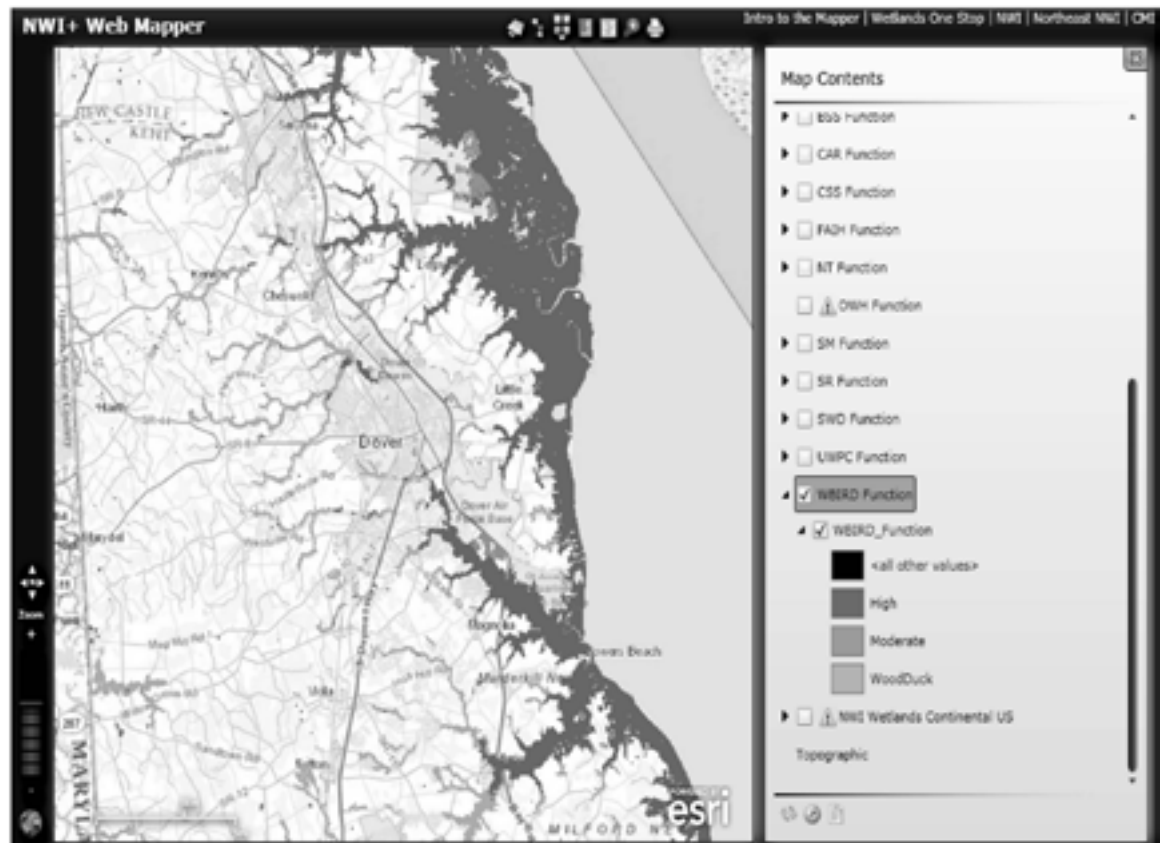


Figure 2: Wetlands around Dover, Delaware predicted to be important for waterfowl and waterbirds as displayed on the NWI+ Web Mapper. (Note: Color converted to black and white for this article.)



Click on the “Wetland Codes” box for access to NWI and LLWW codes as described above. In the coastal zone, most of these type 2 restoration sites are either partly drained wetlands (with “d” modifier in the NWI code) or tidally restricted wetland. The former are extensively ditched (e.g., E2EM1Pd in NWI code) while the latter are separated by other tidal wetlands by roads and/or railroads (look for “td” – tidally restricted/road or “tr” – tidally restricted/railroad in the LLWW code). For inland wetlands, type 2 restoration sites also include partly drained wetlands (“d” modifier), impounded wetlands (“h” modifier; often ponds – PUBHh – built on hydric soils), excavated wetlands (“x” modifier, typically ponds – PUBHx – dug out from a wetland), and farmed wetlands (NWI code = Pf or PSSf). Sites designated have impairments that may be restorable through various means including plugging drainage ditches, removing tide gates, installing self-regulating tide gates, increasing culvert sizes, or breaching impoundments, for example.

NWI+ P-WetAreas – this layer identifies “areas that may support wetlands based on soil mapping;” they did not exhibit a recognizable wetland photo-signature on the aerial imagery used for NWI mapping, but were mapped as hydric soils by USDA soil surveys. They are portions of hydric soil map units from the USDA Natural Resources Conservation Service (NRCS) soil survey geographic database (SSURGO database) that were not farmland, roads, residential houses and lawns, or commercial, industrial or “other” development on the imagery used for NWI mapping (see applicable report). Since they were designated as hydric soil map units, they have a high probability of containing at least some wetland despite not possessing a readily identifiable wetland signature on the aerial imagery used by the NWI. It is a well-known fact that NWI methods cannot detect all wetlands (especially drier-end wetlands – seasonally saturated types) due to limitations of remote sensing techniques and the difficulty of identifying some types even in the field. Many of these hydric soil areas are adjacent to mapped wetlands and may therefore represent the drier portion or upper limit of the wetland while other areas may be upland inclusions within a hydric soil mapping unit. Inclusion of these data make the NWI+ database more complete in terms of locating areas of photointerpretable wetlands and other areas with a high probability for wetland occurrence based on soil mapping.

Printing a Map

The “print” function on the Web Mapper will give you the map without the legend. If you want the legend, go to “file” on your browser, then to “print.” You can send the map to your printer or print as pdf. In either case, be sure to have “print set-up” in landscape mode, otherwise image will be distorted on portrait mode.

Other Geospatial Datasets of Interest for Wetland Identification

Other datasets including national datasets can be added to the NWI+ Web Mapper via ArcGIS Online where you can simultaneously view them and build composite maps. These sources can be added using the “Search” command; also click on “The Web” to search the web. The U.S. Fish and Wildlife Service’s wetland data can be linked to the “NWI+ Web Mapper” by typing in “fws wetlands mapper” in the “Search” box, then locate the file on a list of layers that appears. Opening this layer will add all NWI data to your viewer. Another national dataset of particular interest is the National Hydrography Data (NHD) which shows streams and rivers (with flow lines) and watershed boundaries (hydrologic units to the 12 digit level). It can be added by typing in “NHD” in the “Search” box, then locate the file on a list of layers that appears: “nhd (Map Server).” You will then have NHD data for the entire country. Added layers will appear at the top of the list of layers in the Table of Contents.



Figure 3: Example of potential type 1 restoration sites with table showing soil type for area of interest. Sites are mostly cropland (drained hydric soil). Numbers in circles represent multiple polygons, zoom in to locate “dots” for accessing soil code.

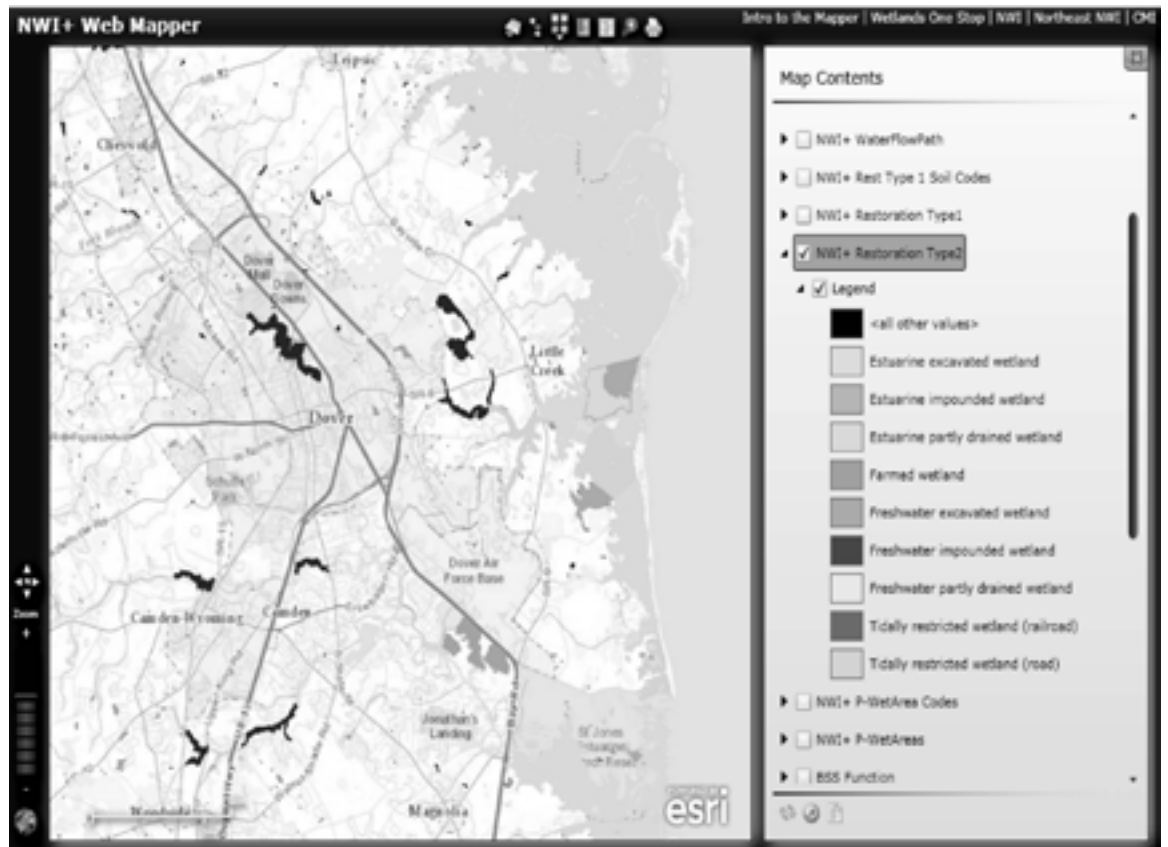


Figure 4: Examples of potential type 2 restoration sites.

Another valuable dataset is soil survey data produced by the U.S. Department of Agriculture. Unfortunately at the present time, their data can't be uploaded onto the NWI+ Web Mapper. Instead you'll have to use their online Web Soil Survey (WSS) mapping tool. After accessing the WSS site, read the directions, then just click on the green button and begin to locate your area of interest and the soils that have been mapped there. With this tool you can produce a map showing soils in your area of interest and also print out the acreage of the soil units in this area. You can also get official soil series descriptions and access copies of archived soil surveys. Information on hydric soils including lists, technical criteria, and the latest guide to field indicators of hydric soils can be accessed at the USDA Hydric Soils site.

Wetland Plant Community Descriptions

The Wetlands One-Stop Mapping website also links to reports and websites that can provide information on wetland plant communities in your area of interest. NWI state wetland reports typically include descriptions of wetland types. State reports however have only been produced for a few states in the Northeast. Descriptions of wetland plant communities for the entire nation can be accessed from two sources: NatureServe and the U.S. National Vegetation Classification. Guidance on how to use these sites is provided at Wetlands One-Stop Mapping.

References

- Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. U.S. Department of the Interior, Fish and Wildlife Service, Washington, DC. FWS/OBS-79/31. http://library.fws.gov/FWS-OBS/79_31.pdf
- Tiner, R.W. 2003a. Dichotomous Keys and Mapping Codes for Wetland Landscape Position, Landform, Water Flow Path, and Waterbody Type Descriptors. U.S. Fish and Wildlife Service, National Wetlands Inventory Program, Northeast Region, Hadley, MA. <http://www.fws.gov/northeast/EcologicalServices/pdf/wetlands/dichotomouskeys0903.pdf>
- Tiner, R.W. 2003b. Correlating Enhanced National Wetlands Inventory Data with Wetland Functions for Watershed Assessments: A Rationale for Northeastern U.S. Wetlands. U.S. Fish and Wildlife Service, National Wetlands Inventory Program, Northeast Region, Hadley, MA. http://www.aswm.org/wetlandsonestop/CORRELATION_REPORT_October_2003R.pdf
- Tiner, R.W. 2011a. Dichotomous Keys and Mapping Codes for Wetland Landscape Position, Landform, Water Flow Path, and Waterbody Type Descriptors. Version 2.0. U.S. Fish and Wildlife Service, Northeast Region, Hadley, MA. http://www.aswm.org/wetlandsonestop/Dichotomous_Keys_March-2012-w-cover.pdf
- Tiner, R.W. 2010. NWIplus: geospatial database for watershed-level functional assessment. National Wetlands Newsletter 32(3): 4-7, 23. http://www.fws.gov/northeast/wetlands/Publications%20PDFs%20as%20of%20March_2008/Mapping/NWIplus_NWN.pdf

Tiner, R.W. 2011b. Predicting Wetland Functions at the Landscape Level for Coastal Georgia using NWIPlus Data. U.S. Fish and Wildlife Service, Region 5, Hadley, MA. In cooperation with the Georgia Department of Natural Resources, Coastal Resources Division, Brunswick, GA and Atkins North America, Raleigh, NC. http://www.fws.gov/northeast/EcologicalServices/pdf/CORRELATIONREPORT_GeorgiaFINAL092011.pdf

